Oroville Facilities Relicensing
Environmental Work Group
Preliminary Issue Sheet

G1. Effects of Project Operations on Geomorphic Processes

Issue Statement: Effects of existing and future project operations on natural geomorphic processes. These include physical attributes and functions (e.g. channel morphology, channel stability, sediment transport and deposition, spawning gravel, large woody debris recruitment, habitat diversity) and subsequent effects on biological resources (e.g., aquatic macro-invertebrates and riparian vegetation) in the low-flow section and the Feather River downstream of Thermalito Afterbay under wet and dry year criteria.

Resource Goals:

- ~~Operate project facilities to m~~Minimize and mitigate adverse project impacts to the extent feasible on natural geomorphic processes in the downstream reaches.
- Maintain and enhance or increase aquatic and terrestrial habitat.
- ♦ Minimize project impacts on the erosion of downstream properties and resources of statewide significance (as defined in CEQA).

Scope: In the Feather River downstream of the Fish Barrier Dam to the confluence with the Yuba River. (Note: Add language describing potential to expand scope based on information collected. For example, it may become clear that impacts extend beyond confluence with Yuba River, requiring expansion of initial scope without delaying the license.) Will be done globally.

Existing Information:

1. "Feather River Spawning Gravel Baseline Study", published by the Department of Water Resources-Northern District, 1982 provides information on sediment transport, spawning gravel quality, enhancement opportunities and hydrology. The report defines spawning gravel goals and criteria and the effect of the dam on downstream sediment resources. Several updates of gravel size distribution have also been published.

2. The report "Use of Alternative Gravel Sources for Fishery Restoration and Riparian Habitat Enhancement, Shasta and Tehama Counties, California" prepared for DFG by DWR-ND provides information on conducting spawning gravel rehabilitation activities.

3. Watershed conditions, including erosion, landsliding, and sediment production from the North, Middle, and South forks of the Feather River upstream from Lake Oroville were estimated in a Department of Water Resources-Northern District memorandum dated 1994. This will provide the information on incoming sediment loads to Lake Oroville from the next reservoir upstream.

4. Lake Oroville sedimentation was measured using lake transects by DWR_ND. Results were reported in the " 1993-1994 Lake Oroville Siltation Study". The report provided information on the sediment production of the upstream watersheds, information required to estimate sediment losses to the downstream ecosystem.

5. Feather River downstream from Oroville Dam is monitored continuously at a number of gaging stations, providing hydrologic date necessary to estimate pre- and post dam hydraulic changes. The data are available from the California Data Exchange Center.

6. The U.S. Geological Survey published "Sediment Transport in the Feather River, Lake Oroville to Yuba City, California" provides information prior to 1967 on sediment transport, hydrology, hydraulic geometry, and other channel characteristics. This report will be useful in determining changes between the completion of Lake Oroville and the present.

7. Feather River IFIM Study by DWR, 1994

~~USGS 1972 sediment transport study at Honcut~~

~~Evaluation of fish populations at Oroville (1977 report)~~

8. Aerial photographs of the Feather River Area from various years beginning in 1937 and ending in 2001

~~Fact finding report (Patrick Porgans delivered to DWR)~~

~~(additional information provided by Patrick Porgans, Mike Meinz, Craig Fleming)~~

9. Yuba River studies ~~– Yuba County flood studies~~

10. Sample study plans developed for north fork Feather River and Trinity River Study (USFWS)

11. See partial Bibliography attached

Information Needed:

1. Literature review of the above referenced and other documents to determine data gaps

2. Gather additional information as necessary to complete the following analyses

   a. ~~1.~~ Physical Data- Bank erosion locations, historic channel changes, historic photographs, cross-sections, and old survey maps showing pre- and post dam

conditions, including channel width, cross-sectional area, vegetation, channel roughness, gradient, depth, flow, velocity, bankfull discharge, and riverbed material (cobble, sand, silt, etc). Also need historic spawning gravel data. New surveys of the channel thalweg and cross-sections~~,~~ will be done and compared to the historic data.

b. ~~2.~~ Develop Process Rates- Develop geomorphic process rates for bank erosion, sedimentation, sediment routing, spawning gravel and bedload movement under different flow conditions.

c. ~~3.~~ Perform analysis of project impacts on river geomorphology using HEC6 and Fluvial-12 modeling.

d. ~~4.~~ Evaluate effect of project on habitat suitability (including woody debris) and riparian vegetation resources.

e. Perform analysis of ~~S~~selected photo flight lines.

f. Develop estimates of ~~C~~coarse sediment storage that would be available for reworking by the river.

Level of Analysis:

Conduct field-work to include measurements of bank erosion, sediment transport, and other monitoring activities throughout the year and under different hydrologic conditions as they occur during the study period in project waters.

Perform a literature review of the existing historic data of channel locations, cross-sections, sediment transport and flow parameters to develop the pre project conditions.

Using sediment transport modeling, analyze and compare the pre and post-project conditions to establish the project-related impacts.

Bibliography

U.S. Geological Survey, *Sediment Transport in the Feather River, Lake Oroville to Yuba City, California*, 1978.

California Department of Water Resources (Delta Branch), *Establishment of Feather River Channel Characteristics*, 1965.

California Department of Water Resources (Northern District), *Feather River Spawning Gravel Baseline Study*, 1982.

California Department of Fish and Game, *An Evaluation of Fish Populations and Fisheries in the Post-Oroville Project Feather River*, 1977.

U. S. Army Corps of Engineers, *Flood Plain Information of the Feather and Yuba Rivers From Marysville to Yuba City, California*, 1968.

U. S. Army Corps of Engineers (Sacramento District), *Report on Reservoir Regulation for Flood Control, Oroville Dam and Reservoir*, 1970.

Patrick Porgans & Associates (Government Regulatory Specialists), *Feather River Watershed " Governmental Bathymetric Studies Documenting Sediment Deposition at Lake Oroville and Geomorphological Changes Within the Feather River Watershed, Above and Below Oroville Dam"*, 1997.

Patrick Porgans & Associates (Government Regulatory Specialists), Feather River and Yuba River Water Basins "Watershed Conditions and Government Activities Leading Up To the 1996-97 Floods", 1997.

Blodgett, J.C., U. S. Geological Survey, Water Resources Division, *Determination of Channel Capacity of the Feather River Between Oroville and Honut Creek, Butte County, CA*, 1972.

California Department of Water Resources, *Confidential Report to Board of Consultants, Feather River Damage Studies, Preliminary, Description of River Channels and Overflow Basin and Disposition of Flood Waters Under Natural Conditions*, By Herald H. Jones, 1950.

Oroville Facilities Relicensing
Environmental Work Group
Preliminary Issue Sheet

G2. Project Effects on Channel Capacity and Storage for Flood Protection

Issue Statement: Project effects on channel capacity and potential need for more storage for flood protection.

(Pass issue statement to Engineering and Operations Group and let them decide how to resolve issue and report back to Environmental WG of decision)

Resource Goals:

- ~~Operate the project in a manner to maintain~~ Maintain channel design capacity and reduce the risk of flooding
- Maintain and enhance channel and floodway capacity.
- Maintain and enhance flood routing characteristics to maintain the current level of risk or reduce the risk of flooding.
- Operate the project in a manner consistent with the floodflow releases required in the Corps manual.

Scope: Within the FERC project boundary downstream of the Fish Barrier Dam to the confluence with the Yuba River.

Existing Information:

1. Feather River downstream from Oroville Dam is monitored continuously at a number of gaging stations, providing hydrologic date necessary to estimate pre- and post dam hydraulic changes. The data are available from the California Data Exchange Center.

2. "Feather River Spawning Gravel Baseline Study", published by the Department of Water Resources-Northern District, 1982 provides information on sediment movement, channel roughness and channel degradation.

3. Watershed conditions, including erosion, landsliding, and sediment production from the North, Middle, and South forks of the Feather River upstream from Lake Oroville were estimated in a Department of Water Resources-Northern District memorandum dated 1994.

4. Lake Oroville sedimentation was measured using lake transects by DWR-ND. Results were reported in the " 1993-1994 Lake Oroville Siltation Study". The report provided information on the sediment production of the upstream watersheds, information required to estimate sediment losses to the downstream ecosystem.

5. The U.S. Geological Survey published "Sediment Transport in the Feather River, Lake Oroville to Yuba City, California" provides information prior to 1967 on sediment transport, hydrology, hydraulic geometry, flood control levees, and other channel characteristics. This report will be useful in determining changes in channel capacity between the completion of Lake Oroville and the present

6. The results of the US Army Corps of Engineers' comprehensive flood control study for the Central Valley, and existing Corps and DWR flood management data.

Information Needed:

1. Survey Data- new surveys, including river cross-sections and thalweg profiles.

2. Topographic maps (2-foot contours recommended), geologic maps, meander belt, geologic channel control.

3. Analyze the effects of existing and future project operations on storage, and flood protection in the low-flow section and the Feather River downstream of Thermalito Afterbay under wet and dry conditions. These include channel attributes and functions such as channel capacity, morphology, stability, sediment transport, deposition, and water levels for various flow conditions.

4. Identify areas within the channel downstream of Project facilities where flows are restricted below channel design capacity

Level of Analysis:

Perform literature review of existing information on channel changes, cross-sections, and old survey maps showing pre- and post dam conditions, including channel width, cross-sectional area, vegetation, channel roughness, gradient, depth, and etc.

Conduct fieldwork as required to acquire new cross-section surveys to compare with historic cross-sections.

These existing and new data will be used to evaluate changes in channel capacity and storage within the reservoir.

The FERC relicensing analysis will focus on determining the impact of Oroville's effect on channel capacity. DWR will continue to work with the Corps though its existing comprehensive flood control study to determine the need for additional storage for flood protection.

Oroville Facilities Relicensing
Environmental Work Group
Preliminary Issue Sheet

G3. Coordinating Long-Range Watershed planning activities with Local, State, Federal Agencies and Local Landowners

Issue Statement: The need to coordinate long-range watershed planning activities with local, state, and federal agencies and private landowners.

In reviewing this issue statement, the task force agreed that no study was needed to address coordination of long-range watershed planning activities. The existing Upper Feather River Coordination Program, of which DWR is a participant, currently considers watershed issues. The requirement for DWR to coordinate with agencies and landowners on activities outside the project boundary was considered by the task force members to be outside the scope of FERC jurisdiction. We note, however, that through the Federal Power Act, the Federal Energy Regulatory Commission (FERC) is required to consider the extent to which the Oroville Facilities is consistent with a comprehensive plan for improving, developing, or conserving a waterway or waterways affected by the project. Accordingly, as no dedicated study is needed and as the issue is not within FERC' s jurisdiction, the Task Force recommends that this issue be considered as a potential settlement issue to be proposed by settlement participants during settlement negotiations. (Wayne will work with Steve to adjust language) Determine place or bin to hold this until needed.
~~(Wayne will fashion discussion of issue statement fate.)~~

~~**Resource Goals:**~~
~~Minimize adverse project impacts on coordination of long-range watershed planning. Maintain and improve long-range watershed planning.~~

~~**Scope:** Within the FERC project boundary upstream of Lake Oroville and within the flood plain of the Feather River downstream to the Yuba River.~~

~~**Existing Information:**~~

~~U.S. Forest Service Environmental Impact Statement for forested areas in the watershed, specifically the Plumas National Forest, provide information on goals and criteria. The Service has also published reports on its Watershed Improvement Program, Management Program, Riparian Initiative Assessment Reports, Land and Resource Management Plans, Cumulative Watershed Effects Reports, Stream Classification and Channel Condition Surveys, Sediment Source Inventories, and Watershed Plans. These data provide background data for the coordination efforts between the stakeholders.~~

~~Memorandum of agreement between various parties for regional erosion control plan for the east Branch North Fork Feather River watershed now including the Middle Fork Feather River.~~

~~Pacific Gas and Electric, HydroPower Benefits of Cooperative Watershed Management.~~

~~Information Needed:~~

~~1. Coordinate with the Feather River Coordinated Resource Management Group to provide a forum for discussing issues~~

~~2. Perform an analysis of project impacts on Watershed Coordination.~~

~~Level of Analysis:~~

~~Conduct a literature review of all management coordination activities currently underway within the watershed.~~

Oroville Facilities Relicensing
Environmental Work Group
Preliminary Issue Sheet

F2. Effects of Project Operations on Fish Diseases

Issue Statement: Effects of past, existing and future project operations (e.g. pump-back operations, hatchery production, water temperature, etc.), on the establishment, transmission, extent, and control of IHN, BKD, and other significant cold-water and warm-water fish diseases within Lake Oroville and lower river.

Resource Goals:

- Minimize or eliminate adverse project related effects on ~~significant~~ fish diseases within project waters, and project affected waters.
- Initiate efforts to minimize or eliminate adverse project related effects on IHN within project waters, and project affected waters prior to license application submittal
- Healthy freshwater and ocean fishery

Scope: ~~This issue relates to those diseases in~~Within the FERC project boundary waters~~,~~ and ~~project affected waters. Project affected waters include~~ the tributaries upstream to the current upper migratory limit, and the Feather River downstream from the Fish Barrier Dam to Honcut Creek.

Existing Information:

1. DWR ~~L~~letters to FERC (4/ 16/ 01 & 7/ 13/ 00) - updates to FERC regarding IHN and its impact on Lake Oroville fishery management.

2. California Department of Fish and Game (DFG) sponsored IHN resistance study at University of California, Davis - preliminary reports:
    a. Various salmon and trout strains investigated, including coho and kokanee salmon, lake trout, brook trout, brown trout, rainbow trout-Pit River strain, coastal and Lahontan cutthroat trout

3. DFG Fish Health Lab r~~R~~eports on IHN at Feather River Hatchery - prepared periodically during the year, particularly during the fall spawning season.

4. Miscellaneous DFG Fish Health Lab r~~R~~eports - various fish diseases (both warm and cold water) that occur periodically in project waters, as well as other similar California waters.

5. Miscellaneous ~~Publications~~ publications on ~~Hatchery~~ fish d~~D~~iseases - from State and ~~Federal~~ federal fish and wildlife agencies and other appropriate sources, such as:
    a. DFG Fish Bulletins
    b. U.S. Fish and Wildlife Service publications
    c. State of Washington, Department of Fisheries, Hatchery Division
    d. Utah Division of Wildlife Resources

6. DWR t~~T~~emperature d~~D~~ata - temperature data in water in and around project:
    a. Collected at various locations in/ around the Lake Oroville Area, such as Lake Oroville, Feather River Hatchery, Thermalito Forebay and Afterbay, Feather River at Robinson Riffle, and in the North, South, and Middle Forks Feather River

7. DWR/ DFG w~~W~~ater t~~T~~emperature c~~C~~riteria for the Feather River Hatchery - agreement between DWR and DFG on temperatures for the Feather River Hatchery.

8. National Marine Fisheries Service t~~T~~emperature c~~C~~riteria for the Feather River at Robinson Riffle - temperature requirements for salmon and steelhead in Feather River low flow channel.

9. DWR Lake Oroville Annual Reports of Fish Stocking and Fish Habitat Enhancements to FERC, 1994-1999 - Lake Oroville fishery management information:
    a. Resident fish stocking data
    b. Resident fish species data
    c. Fish habitat enhancement projects

10. DWR Lake Oroville 90-Day Fishery Reports to FERC, 1995-1999 - Lake Oroville fishery management information:
    a. Resident fish species data
    b. Resident fish stocking data
    c. Fish habitat enhancement projects
    d. Temperature profiles

11. Feather River Hatchery Annual Reports 1964 through 2000 - hatchery reports of salmon and steelhead trapping, spawning, and rearing.

12. Pumpback operations data at Thermalito and Hyatt power plants.

13. Other historic literature related to diseases within the Feather River drainage

Information Needed:

1. ~~Identification of fishery resources~~Identification of fishery resources ~~with significant management concerns~~ potentially affected by diseases in each of the project waters, and Feather River using field sampling and literature review.

2. DFG sponsored IHN resistance study at University of California, Davis, and Feather River Hatchery - Final Report (study is currently underway):
    a. Various salmon and trout strains investigated, including coho and kokanee salmon, lake trout, brook trout, brown trout, rainbow trout-Pit River strain, coastal and Lahontan cutthroat trout

3. DFG - IHN evaluation (field sampling and laboratory analysis) of salmonids in the Diversion Pool/ Forebay, lower Feather River and selected Lake Oroville tributary waters.

4. Literature review of other (non-IHN) fish disease ~~concerns~~ outbreaks ~~and project related effects on their establishment, extent, and control,~~ within the project waters and tributaries upstream to the current upper migratory limit and in the Feather River downstream from the fish barrier dam to Honcut Creek. ~~and project affected waters~~. This review analysis will identify the documented disease outbreaks in these waters, the life history characteristics of these diseases, the outbreak timing and duration, the mechanism of disease transmission, control methods, and, if possible, a determination of whether the project affected the establishment, extent, and control of these disease outbreaks. ~~and determination of the significance of these concerns. This review and analysis will include identification of the mechanism of disease transmission. (re-word to draw out information specific to Feather River watershed to provide adequate baseline information)~~

5. DFG fish health lab reports will be reviewed, as well as Feather River Hatchery reports, and DFG Administrative Reports and other records which document disease outbreaks in the project waters and project affected waters. The determination of project effects, if possible, will be identified in the review of these documents, along with analysis of project operations data during the time of the disease occurrence.

Level of Analysis:

Field and DFG lab studies of the significant fish diseases, and a desk top study of how project operations may be affecting the establishment, transmission, extent, and control of IHN, BKD, and other significant fish diseases.

California Department of Water Resources
Oroville Facilities
Preliminary Issue Sheet

F4. Project Effects on Resident Fish Passage

Issue Statement: Project effects on resident fish passage, including North Fork Feather River at Big Bend Dam, tributary streams, and project affected waters.

Resource Goals:

- Minimize and mitigate adverse project related effects on the passage of ~~significant~~ resident fish.
- Enhance passage of ~~significant~~ resident fish.

Scope: Within the FERC project boundary waters and the tributaries upstream to the current upper migratory limit, and the Feather River downstream to Honcut Creek.(insert global discussion of scope expansion)~~This issue relates to resident fish (as opposed to anadromous fish) within the FERC project waters, and project affected waters. Project affected waters include the tributaries upstream to the current upper migratory limit, and the Feather River downstream from the Fish Barrier Dam to Honcut Creek.~~

Existing Information:

1. DWR Lake Oroville Annual Reports of Fish Stocking and Fish Habitat Enhancements to FERC, 1994-1999 - Lake Oroville fishery management information:
    a. Resident fish stocking data
    b. Resident fish species data

2. DWR Lake Oroville 90-Day Fishery Reports to FERC, 1995-1999 - Lake Oroville fishery management information:
    a. Resident fish species data
    b. Resident fish stocking data

3. DWR Lake Oroville Fisheries Habitat Enhancement Plan, 1995 - Lake Oroville fish habitat information.

4. DWR Lake Oroville Fishery Management Plan Progress Report, October 1993 - Lake Oroville fishery information, tributary and migration barrier information.

5. Abundance and emigration timing of juvenile salmon and steelhead since 1996. Data comes from DWR-ESO operation of rotary screw traps, fyke traps, and seining. Traps typically operated from December through J une.

6. Distribution and habitat use of juvenile salmon and steelhead. DWR-ESO study began in Spring of 1999, utilizes snorkeling observations. Surveys are conducted from March - August on the Feather River between the Fish Barrier Dam and Gridley Bridge.

7. Pacific Gas and Electric Company FERC relicensing proceedings and studies of North Fork Feather River projects ~~--~~ including draft Poe Project License Application. Information on North Fork Feather River habitat and fish.

8. USGS s~~S~~tream g~~G~~age d~~D~~ata, North, Middle, South Forks Feather River, West Branch.

9. DWR temperature data collected at Lake Oroville, the North, South, and Middle Forks Feather River.

10. DWR project operations data, including surface elevations of project reservoirs and inflow/ outflow data.

Information Needed:

1. Phase-one assessment of non-project and project~~--~~created barriers, and significance of these barriers using field sampling and literature review.

2. Assessment of affected resident fish in the project waters, and project affected waters:
    a. Identification of ~~significant~~ resident migratory fish
    b. Life history characteristics related to migration
    c. Analysis to determine project impacts

3. If analysis of project impacts determines ~~significant (squishy definition, not NEPA)~~ adverse project effects ~~(propose clarify criteria for effects to be mitigated - define adversel approach or within study plans)~~ :
    a. Phase 1 assessment of potential mitigation measures
    b. Assessment of feasibility of mitigation measures, and potential impacts on established fisheries and other wildlife
4. Identify ~~L~~likely development plans that could affect resident fish passage.

Level of Analysis:

Field assessment and desk~~-~~top study of how project operations may be affecting resident fish passage.

Environmental Workgroup
Oroville Facilities Relicensing
Preliminary Issue Sheet

F10. Anadromous Fish Habitat

Issue Statement: Effect of project facilities and operations on anadromous fish habitat and populations (e.g. instream flows, water temperature, ramping rates, riparian habitat, large woody debris, spawning gravel, stranding and desiccation, macro-invertebrate prey base, upstream and downstream passage, rearing conditions)

Resource Goals:

- Minimize and mitigate adverse project impacts on habitat, genetic integrity and population size of anadromous fishes.
- ~~Restore steelhead and spring-run chinook to levels at which they are not threatened with extinction.~~
- Increase natural production of steelhead, spring-run and fall-run chinook salmon and other anadromous fish.
- Provide populations of anadromous fish sufficient to support desired recreational and commercial fisheries.

Scope: The Feather River downstream from the Fish Barrier ~~Thermalito Diversion~~ Dam to Honcut Creek.(insert global language related to scope expansion -- discuss specific issues related to project operations with USFWS, NMFS, CDFG, SWC, TU) ~~Studies would extend from the Fish Barrier Dam, through low flow channel and downstream to Honcut Creek. Areas downstream of this point do not provide suitable spawning or rearing habitats for salmonid anadromous fishes. Spring-run salmon, fall-run salmon and winter steelhead would be the primary target of anadromous fish studies. Information would also be collected on other anadromous fish, such as striped bass, American shad and sturgeon.~~

Existing Information:

1. Abundance and emigration timing of juvenile salmon and steelhead since 1996. Data comes from DWR-ESO operation of rotary screw traps, fyke traps, and seining. Traps typically operated from December through J une.
2. Annual population estimates for fall and spring run salmon returning to spawn. Surveys conducted by DFG (using various methods) every Fall since 1954.
3. Distribution and habitat use~~-~~ (Including riparian habitat use) of juvenile salmon and steelhead. DWR-ESO study began in Spring of 1999, utilizes snorkeling observations. Surveys are conducted from March - August on the Feather

River between the Fish Barrier Dam and Gridley Bridge~~. (Including riparian habitat use)~~

4. Survival and contribution rate of "wild" and hatchery produced salmon.
    a. DWR-ESO and DFG have been implanting coded wire tags in juvenile hatchery salmon since 1975. DWR-ESO began tagging "wild" juvenile salmon in 1998.
    b. Tags are recovered through ocean and inland harvest recovery programs coordinated by DFG.
    c. New analysis of tag recoveries underway through contract with SFSU Romberg Tiburon Center and USFWS.
5. Habitat surveys, habitat maps and gravel surveys.
    a. Depth, current velocity, substrate, in-stream cover, over-head cover are recorded as part of DWR-ESO steelhead and salmon habitat use studies in 1999 and 2000.
    b. Riffles, pools, glides and backwater habitats have been delineated on aerial photographs from the Fish Barrier Dam to the Gridley Bridge. This mapping was conducted by DWR-ESO as part of lower river fish studies in 1999, and with 1992 IFIM studies.
    c. DWR Northern District published Feather River gravel condition reports in 1982 and 1996.
6. Historic stream flows in the low flow channel and below Thermalito Afterbay outlet.
7. Temperature data from the low flow channel and below Thermalito Afterbay outlet
    a. Hourly temperatures recorded at 20 sites between the Thermalito Diversion Dam and Live Oak by DWR-ESO. Began in 1997 but records are incomplete until 1999.
    b. USGS recorded temperatures at gage downstream from Oroville Dam, 1958 to 1992, continuous temperatures since 1995. ? ? ?
    c. OFD has recorded mean daily water temperatures at the Feather River Hatchery since initiation of hatchery operations and Robinson Riffle since J uly 31, 2000.
    d. USGS has published records of maximum and minimum daily water temperatures at the Thermalito Afterbay Outlet from October 1968 through September of 1992. Since 1992, only mean daily water temperature data is available from OFD.
    e. River temperature model developed by UC Davis under contract with DWR-ESO in 2000
8. DWR-ESO Instream Flow study from 1992. Thirty-two transects selected between the Fish Barrier Dam and Honcut Creek. Salmon, steelhead and American shad were the target species.
9. Laboratory study on steelhead growth and thermal biology. Study conducted by UC Davis in 1999 under contract with DWR-ESO.
10. Macro-invertebrate food base available for rearing salmon and steelhead. Study began in Fall 2000 and will continue for two years. Funded by DWR-ESO through contract with Chico State University.

11. Stranding and redd dewatering study by DWR-ESO began in Fall 2000. Study will identify potential stranding areas between the Fish Barrier Dam and Honcut Creek, and attempt to quantify salmonid losses.
12. 2000 Spring-run and steelhead Biological Assessment
13. 2001 Spring-run and steelhead Biological Opinion
14. Anadromous studies from USFWS, CVPIA working paper and restoration plan
15. CDFG plan for action
16. CDFG plan for restoration of anadromous fish
17. Genetic studies by CDFG and UC Davis, Bodega Marine Lab
18. Yuba River studies related to anadromous fish
19. Data from DFG and USFWS from downstream juvenile salmonid migration studies (i.e. screw traps in Sacramento River, fyke traps, midwater trawl and Kodiac trawl studies in Sacramento River, Broad Slough, Honker Bay, Carquinez Strait, San Pablo Bay, San Francisco Bay). Information available from Bay/ Delta Region DFG and USFWS.

Information Needed:

1. Accurate data on arrival timing, spawning season, and population size of adult spring-run salmon. This information would be gathered by operating an upstream migrant counting facility, using a weir and/ or hydroacoustics. Supplemental information would also be gathered by extending the operational period of the Feather River Hatchery fish ladder and by conducting intensive year-round angler surveys in the Feather River.
2. Data on arrival timing and population size of "wild" adult steelhead. This information would be gathered by operating an upstream migrant counting facility, using a weir and/ or hydroacoustics. Supplemental information would also be gathered by extending the operational period of the Feather River Hatchery fish ladder and by conducting intensive year-round angler surveys in the Feather River.
3. Residence time, survival and growth of adult and juvenile steelhead in the low flow channel and habitat usage from Honcut Creek to confluence with Sacramento River (dependant on scope adjustment). This information would be gathered by tagging steelhead and tracking their movement, survival and growth while living in the Feather River.
4. Preliminary instream flow study designed to evaluate channel changes since 1992 IFIM study and to specifically address flow effects on juvenile steelhead
5. Literature review on basic life history and potential project impacts on non-salmonid anadromous fishes including striped bass, American shad, green sturgeon, and white sturgeon.
6. Continuation and/ or modification of studies listed in existing information, specifically item numbers 1, 3, 4, 5a, 7a, 10, and 11.
7. ~~7.~~ Synthesis of existing and new information to evaluate project impacts on anadromous fishes.

Level of Analysis:

Because of existing information database, the study will rely on the existing literature and ongoing studies, and will be augmented as needed with site specific studies identified above to assess project effects on anadromous fish habitat and populations. Studies of juvenile salmonids will focus on spring through summer, when this life stage is most abundant and susceptible to unfavorable water temperatures or flows.

Environmental Workgroup
Oroville Facilities Relicensing
Preliminary Issue Sheet

F15. Upstream Habitat for Anadromous Fish

Issue Statement: Evaluate the quantity and quality of existing upstream habitat conditions and potential sources of mortality for anadromous salmonid spawning, rearing, and juvenile emigration. If upstream habitat conditions and constraints (e.g. disease transmission) are considered to be suitable, evaluate the feasibility of alternative methods for providing passage of anadromous salmonids (e.g. fish ladder, fish elevator, bypass channel, trap-and-truck), upstream of Oroville Dam. Assess conflicts and constraints among species and life stages and their habitat, and evaluate the overall biological benefits to the species and upstream ecosystem (e.g. nutrient transfer).

Resource Goals:

- Minimize and mitigate adverse project-related effects on anadromous fish passage and ecological functions.

- Provide populations of anadromous fish sufficient to support desired fisheries and ecological functions.

- ~~Improve health of Lake Oroville tributaries by facilitating passage and natural reproduction of anadromous fish.~~ Provide for upstream passage of anadromous fish.
- Minimize the effects of non-endemic pathogens carried by anadromous fish transported to the upper watershed.

Scope:

From the Fish Barrier Dam past Oroville Dam to the next upstream migration barriers.

Existing Information:

1. Abundance and emigration timing of juvenile salmon and steelhead since 1996. Data comes from DWR-ESO operation of rotary screw traps, fyke traps, and seining. Traps typically operated from December through J une.
2. Annual population estimates for fall and spring run salmon returning to spawn. Surveys conducted by DFG (using various methods) every Fall since 1954.
3. DWR Letters to FERC (4/ 16/ 01 & 7/ 13/ 00) - update to FERC regarding IHN and its impact on Lake Oroville fishery management

4. California Department of Fish and Game (DFG) sponsored IHN resistance study at University of California, Davis - preliminary reports
    a. Various salmon and trout strains investigated, including coho and kokanee salmon, lake trout, brook trout, brown trout, rainbow trout-Pit River strain, coastal and Lahontan cutthroat trout.
5. DFG Fish Health Lab Reports on IHN at Feather River Hatchery – prepared periodically during the year, particularly during the fall spawning season
6. Miscellaneous DFG Fish Health Lab Reports - various fish diseases (both warm and cold water) that occur periodically in project waters, as well as other similar California waters
7. Miscellaneous Publications on Hatchery Diseases - from State and Federal fish and wildlife agencies, such as:
    a. DFG Fish Bulletins
    b. U.S. Fish and Wildlife Service publications
    c. State of Washington, Department of Fisheries, Hatchery Division
    d. Utah Division of Wildlife Resources
10. DWR Lake Oroville Annual Reports of Fish Stocking and Fish Habitat Enhancements to FERC 1994 through 1999 - Lake Oroville sportfishery management information
    a. Stocking data
    b. Feather River Hatchery production data
11. DWR Lake Oroville 90-Day Fishery Reports to FERC 1995 through 1999 - Lake Oroville sportfishery management information
    a. Stocking data
    b. Feather River Hatchery production data
    c. Lake Oroville temperature profiles
12. Feather River Hatchery Annual Reports 1964 through 2000 - hatchery report of salmon and steelhead trapping, spawning, and rearing
13. Pacific Gas and Electric Company Upper North Fork Feather River Project Relicensing Documents and Proceedings (FERC Project 2105) - Information on tributary (North Fork Feather River) fish populations and habitat
14. Various DFG Management Plans and Activities:
    a. California Angling Regulations
    b. Assessment of California Black Bass Angling Regulations
    c. Strategic Plan For Trout Management
    d. Feather River Hatchery Production Goals and Constraints
    e. DFG Fish Health Lab reports on diseases at Feather River Hatchery, prepared periodically during the year, particularly during the fall spawning season
    f. California Listing of Endangered and Threatened Animals (CCR Title 14, Section 670.5
15. Various Federal Management Plans and Activities:
    a. Federal Endangered Species Act
    b. Various Federal Register Notices (steelhead, spring-run chinook salmon)
    c. Central Valley Project Improvement Act

15. ~~16.~~ Peter Moyle' s survey of habitat upstream of Oroville Dam

16. Upper Yuba River Study Program (CALFED) and other CALFED studies associated with fish passage (CALFED integrated fish passage program)
17. Dudley Riser assessment for Monterey passage (success of fish passage measures correlated with dam size)
18. Lake Billy Chinook fish passage studies – PGE relicensing effort
1.
19. Application for Poe Hydro project.

Information Needed:

~~1.~~2. Literature review of project impacts on habitat for salmon and steelhead upstream of Oroville Reservoir.
~~2.~~3. Literature review of the feasibility and impacts of providing anadromous fish passage above Fish Barrier Dam (for spring-run chinook) and Oroville Dam.
Literature review on the effective transmission of diseases
4.

Level of Analysis:

Desk top study of extent and quality of spawning and rearing habitat for anadromous salmonids and feasibility of passage above and below Oroville Reservoir.

Oroville Facilities Relicensing
Environmental Work Group
Preliminary Issue Sheet

T4. Project Effects on Biodiversity and Ecosystem Health and Stability

Issue Statement: Existing and future project operations on biodiversity (including plant species, seral stages, vegetation types and communities and wildlife) and ecosystem health and stability.

Resource Goals~~/Desired Conditions~~:

- Minimize and mitigate adverse project-related effects on plant and wildlife species diversity
- Maintain viable populations of all native species with emphasis on sensitive species
- Maintain viable populations of desirable non-native animal species
- Minimize and mitigate adverse project-related effects on biodiversity and ecosystem health
- Enhance biodiversity and ecosystem health and stability

Scope: Within the FERC Project boundary and the ~~downstream~~ Feather River floodplain downstream to the confluence with the Yuba River, and other lands outside the boundary as appropriate.
(Within study plan, document rationale for scope and consider recon type of studies to more clearly define scope and needs)

Existing Information:

1. California GAP Analysis Project – land cover and WHR classification maps produced at 1:100,00 scale
2. California Wildlife/ Habitat Relationships Program (Version 7)
3. A Guide to Wildlife Habitats of California, USDA, CDFG, PG&E – wildlife habitat classification system
4. A Manual of California Vegetation, California Native Plant Society - vegetation classification system
5. Manual of the Vascular Plants of Butte County, California. V. Oswald, 1994.
6. The J epson Manual – Higher Plants of California, J . Hickman, 1993.
7. California Department of Fish and Game, Natural Diversity Database
8. DWR Oroville Facilities project files
9. USFS, Plumas National Forest, vegetation community information
10. US Forest Service, Sierra Nevada Forest Plan, Record of Decision, J anuary 2001
11. Scientific literature

Information Needed:

1. Identification of vegetative/ wildlife habitat communities present within study area, including community structure, dominant species, stratification, and density
2. Maps of vegetation communities and wildlife habitats
3. Calculated acreages of plant communities and wildlife habitat types including ecotone or transition areas, seral stages and canopy closure classes
4. Inventory of plant and animal species present (including seasonal use)
5. Determine potential project effects on wildlife and native plant communities

Level of Analysis:

Field surveys to determine vegetative/ wildlife communities present to incorporate into GIS mapping program. Desktop study to evaluate potential project effects on biodiversity using vegetation/ habitat information.

Oroville Facilities Relicensing
Environmental Work Group
Preliminary Issue Sheet

T5. Project Effects on Riparian Resources and Wetlands

Issue Statement: Project effects on riparian resources and protection and management of riparian habitat and wetlands (including vernal pools and brood ponds).

Resource Goals:

- Minimize and mitigate adverse project-related effects on riparian and wetland ecosystems along the Feather River.
- Enhance riparian and wetland habitats including floodplain and upland wetlands, vernal pools, and brood ponds within the project boundary.
- ~~Project related effects on wetland ecosystems~~

Scope:

Within the FERC project boundary and downstream Feather River floodplain to the confluence with the Yuba River and other lands outside the project boundary as appropriate.

Existing Information:

1. USFWS National Wetland Inventory – GIS dataset of wetlands in Butte County
2. USFS vegetation/ wetland mapping – vegetation mapping performed by Plumas National Forest on USFS system (global replace) lands (including wetland mapping)
3. SCS Soil Survey – Butte County soil survey to identify those types of hydric soils that support wetlands
4. USGS 7.5-minute quad maps – USGS mapping of wetlands, riparian areas, and elevational contours
5. Geographic Information Center (CSU Chico) aerial mapping – ArcView GIS dataset of stand-level mapping of riparian vegetation along the Feather River from the Oroville fish barrier to the Sacramento River
6. Aerial photographs (Current and historical) – changes in riparian zones and channel morphology to determine the extent of change
7. California Waterfowl Association, DWR and CDFG brood pond management, mapping, and creation information
8. DWR vernal pool mapping

Information Needed:

1. Map of riparian areas, bank types, upland and floodplain wetlands, vernal pools, and brood ponds within the project boundary and along the Feather River floodplain to the Yuba River.
2. Extent and composition of the riparian areas along the length of the Feather River down to the Yuba River, including species composition, dominant species, stand density, canopy closure, ground cover, demographics, and types of impacts, if any. Past, current, and proposed flow regimes to project flow-level alterations of riparian areas. Near-river water table levels to determine the effect of differing flow levels on riparian vegetation
3. Types of banks present, their susceptibility to erosion, and vegetative cover along the ~~Lower~~ lower Feather River to the Yuba River.
4. Extent of wetlands and vernal pools within the project boundary and within the active Feather River floodplain down to the Yuba River. Location and mapping of artificial brood ponds within the project boundary.
5. Evaluate project-related effects on riparian and wetland resources

Level of Analysis:

Field surveys and GIS mapping of riparian and wetland systems including bank types. Desktop study to determine ~~the effects of flood and non-flood flow regimes~~project effects on riparian and wetland resources.

Oroville Facilities Relicensing
Environmental Work Group
Preliminary Issue Sheet

T7. Project Effects on Noxious Terrestrial and Aquatic Plant Species

Issue Statement: Effects of the project on the introduction, distribution and management of noxious terrestrial and aquatic weeds.

Resource Goals

- Minimize and mitigate project-related effects on the dispersal of noxious weeds
- Incorporate project lands in county-wide mapping process of noxious weeds
- Control noxious weeds of greatest ecological and agricultural concern
- Remove undesirable non-native plant species around lake, river, forebay and afterbay areas especially star thistle, ailanthus, and other invasive plant species
- Restore disturbed sites with native plant communities
- ~~Determine~~ Minimize and mitigate project-related effects on dispersal of noxious aquatic weeds into downstream irrigation canals

Scope:

Within the FERC project boundary, including a buffer zone, and as appropriate outside of project boundary for project related effects (i.e. downstream irrigation canals and downstream Feather River floodplain to the confluence with the Yuba River

Existing Information:

1. California Exotic Plant Pest Council, Pest Plants of Greatest Ecological Concern, October 1999.
2. California Department of Food and Agriculture, Pest ratings of noxious weed species and noxious weed seeds.
3. Butte County Integrated Weed Management Plan
4. Plumas National Forest, Known or Potential Noxious Weeds List, completed 3/ 98.
5. US Forest Service, Sierra Nevada Forest Plan, Record of Decision, J anuary 2001.
6. Species i~~I~~dentification and m~~M~~anagement i~~I~~nformation via web pages (i.e. National Park Service, The Nature Conservancy, Universities, State agencies, etc.)
7. Plumas-Sierra Noxious WEEDS Management Group, 2000 Strategic Plan
8. California Department of Transportation, Biological control, hand control, and test plot data for yellow star thistle and purple loosestrife
9. California Department of Fish and Game control and test plot data

10. California Department of Food and Agriculture mapping of purple loosestrife infestations
11. California Department of Fish and Game-Oroville Wildlife Area control and test plot data
12. California Department of Transportation control and test plot data
13. California Waterfowl Association weed abatement experiments
14. Butte County Agriculture Commission control and test plot data
15. Butte County Weed Management Area noxious weed location database (upcoming)
16. Local Irrigation control data
17. Habitat preferences for each pest species (i. e. ~~Factors~~ factors affecting distribution)
18. DWR weed control plan
19. California Department of Parks and Recreation management information
20. Document identifying ~~P~~plant species beneficial to waterfowl (Cal Waterfowl Assoc)
21. Draft license application for Poe Hydro project.
~~20.~~

Information Needed:

1. Identify list of noxious weeds
2. Collect information on the biology and ecology of targeted noxious weeds
3. Collect information on mechanisms of dispersal and infestation rates in relation to project operations
4. Map noxious terrestrial and aquatic plant species to identify current distribution within the project boundary and downstream Feather River.
5. ~~Identify~~ Evaluate ~~potential~~ current abatement methodologies and activities by DWR and others~~, their associated costs,~~ and the ~~potential~~ impact on other resources or land uses within and adjacent to the project boundary. ~~uses for control of noxious weeds within the project boundary (note: separate impacts and methodologies on noxious weeds and non-targeted species and other resources)~~
6. ~~6.~~Evaluate potential project effects (i.e. lake and river water levels) on the distribution of noxious weeds
~~7.~~
~~8.~~6. ~~Develop and implement management plans for controlling noxious weeds in areas disturbed by project-related operations.~~

Level of Analysis:

Literature survey to determine potential noxious weed lists, their biology, and factors influencing their distribution. Field studies will include GIS mapping of targeted species. A subsequent desktop study will be used to evaluate project-related effects and the factors influencing their distribution.